MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2019/2020

DBM5014 – BUSINESS MATHEMATICS

(for diploma students only)

12 MARCH 2020

2.30 pm – 4.30 pm

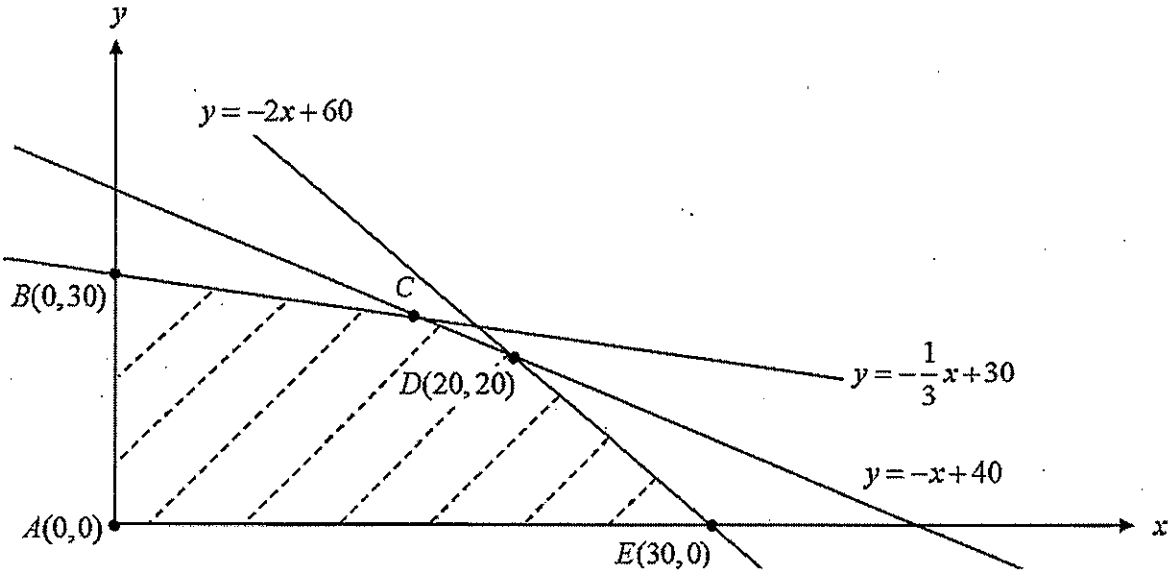
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **3** pages excluding cover page and appendix.
2. Attempt **ALL FOUR (4)** questions. The marks distribution for each question is given.
3. Write all your answers in the Answer Booklet provided.
4. Key formulae are given in the Appendix.

Question 1

a) Tadaa Company sells x units of online agent tickets and y units of offline agent tickets. It is found that the profit for each online and offline tickets is RM500 and RM900 respectively. The following graph describes the constraints for the tickets selling.



i. List down the constraints (other than $x, y \geq 0$) obtained from the graph. (3 marks)

ii. Determine the coordinate of point C. (5 marks)

iii. From the graph, evaluate each of the corner points if given that the objective function is $P = 500x + 900y$. (5 marks)

iv. From answer in part (iv), identify the maximum profit of x units of online agent tickets and y units of offline agent tickets. (2 marks)

b) The following table shows the ingredients to produce Cheesekut Oreo and Cheesekut Milo dessert. It requires at least 35 pieces of biscuits, maximum of 20 pieces of cheese and at most 15 spoon of condensed milk.

	Cheesekut Oreo (X)	Cheesekut Milo (Y)
Biscuits	5	7
Cheese	2	4
Condensed milk	3	5

i. List the linear inequalities that satisfy the above conditions. (4 marks)

ii. Hence, determine the x and y intercepts for each condition. (6 marks)

[TOTAL 25 MARKS]

Continued...

Question 2

a) Tyara saves her money in JunBank and EmBank. JunBank pays 1.25% per annum compounded quarterly and EmBank pays 1.55% per annum compounded monthly.

i. Find the effective rate of each bank. (4 marks)

ii. Identify which bank offers a better return to her. (1 mark)

b) Zach is considering buying a car. He managed to list down his car preferences from motortrader.com as shown in the following table.

	New Car	Used Car
Model	Honda City 1.5 i-VTEC	Honda City 1.5A
Selling price	RM65800	RM49800
Registered year	2019	2017
Bank	Bank Islam	RHB Bank
Loan period	9 years	5 years
Interest rate	3.05%	5.50%
Type of interest	Simple interest	Compounded monthly

i. Based on the table above, calculate the loan amount for both cars if 10% deposit is charged from the selling price. (4 marks)

ii. Compute the interest charged by Bank Islam with simple interest rate. (2 marks)

iii. Hence, how much Zach needs to pay Bank Islam in total? (1 mark)

iv. From answer in part (iii), calculate the monthly payment for new car. (2 marks)

v. Find the monthly payment for used car. (5 marks)

vi. Which car pays less monthly payment? (1 mark)

c) Calculate the future value of the annuity of RM500 per month for 6 years with interest paid monthly at an annual rate of 2.75%. (5 marks)

[TOTAL 25 MARKS]

Question 3

a) Given $y = 1919 + \frac{\ln x}{1919} + 1919e^x - 1919x + 1919\pi$.

i. Find y'. (5 marks)

ii. Hence, find y''. (3 marks)

b) Use **Product Rule** to differentiate $f(x) = \left(3x^3 - 7\right)\left(9 + 2x^5\right)$. (6 marks)

Continued...

c) Given a function $y = \frac{1}{\left(8+9x^2\right)^{2020}}$.

i. Find $\frac{dy}{dx}$ by using **Chain Rule**. (7 marks)

ii. Hence, from answer in part (i), identify the value of p and q if $\frac{dy}{dx} = \frac{px}{\left(8+9x^2\right)^{q}}$. (2 marks)

d) Evaluate the marginal revenue function, $\frac{dr}{dq} = 20.20q^2 - 20\sqrt{q}$ when $q = 25$. (2 marks)

[TOTAL: 25 MARKS]

Question 4

a) Evaluate the indefinite integral $\int\left(5x^4 - \sqrt{45} + \frac{4}{5}e^x + \frac{4}{5x}\right)dx$. (5 marks)

b) Given that $\int 9x\left(9x^2 - 2019\right)^9 dx$.

i. If $u = 9x^2 - 2019$, find $\frac{du}{dx}$. (1 mark)

ii. Hence, evaluate $\int 9x\left(9x^2 - 2019\right)^9 dx$ by using the **Substitution Rule**. (6 marks)

c) Given that $\int_2^4 f(x)dx = 20$. Determine the value of m if $\int_2^4 f(x)\,dx + \int_0^5 m\,dx = 55$. (7 marks)

d) It is found that marginal-cost function for a company that produces x units of trousers is $\frac{dc}{dx} = 2.5x^3 + 20x$.

i. Determine the total-cost function, $c(x)$. (3 marks)

ii. Hence, calculate the total cost from 10 to 20 units. (3 marks)

[TOTAL 25 MARKS]

End of Paper.

APPENDIX – FORMULAE

Effective Rate
$r_e = \left(1+\frac{r}{n}\right)^n - 1$

Simple Interest	Future Value
$I = Prt$	$FV = PV\left(1+\frac{r}{n}\right)^{n\times t}$
Present Value Annuity	**Future Value Annuity**
$A = R\left[\frac{1-\left(1+\frac{r}{n}\right)^{-n\times t}}{\frac{r}{n}}\right]$	$S = R\left[\frac{\left(1+\frac{r}{n}\right)^{n\times t}-1}{\frac{r}{n}}\right]$

Derivatives

1. $\frac{d}{dx}\left(ax^n\right) = anx^{n-1}$	2. $\frac{d}{dx}[g(x)]^n = n[g(x)]^{n-1}\cdot g'(x)$
3. $\frac{d}{dx}[f(x)g(x)] = f(x)g'(x)+g(x)f'(x)$	4. $\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{g(x)f'(x)-f(x)g'(x)}{[g(x)]^2}$

Logarithmic Functions	Exponential Functions	Chain Rule
$\frac{d}{dx}(\ln x) = \frac{1}{x}$	$\frac{d}{dx}\left(e^x\right) = e^x$	$\frac{dy}{dx} = \frac{dy}{du}\cdot\frac{du}{dx}$
$\frac{d}{dx}\ln u = \frac{1}{u}\cdot\frac{du}{dx}$	$\frac{d}{dx}e^u = e^u\frac{du}{dx}$	

Integration

1. $\int k dx = kx + C$	2. $\int ax^n dx = \frac{ax^{n+1}}{n+1} + C, \quad n \neq -1$
3. $\int e^x dx = e^x + C$	4. $\int \frac{1}{x} dx = \ln x + C$
Definite Integral, $A = \int_a^b f(x)\,dx = F(b) - F(a)$	